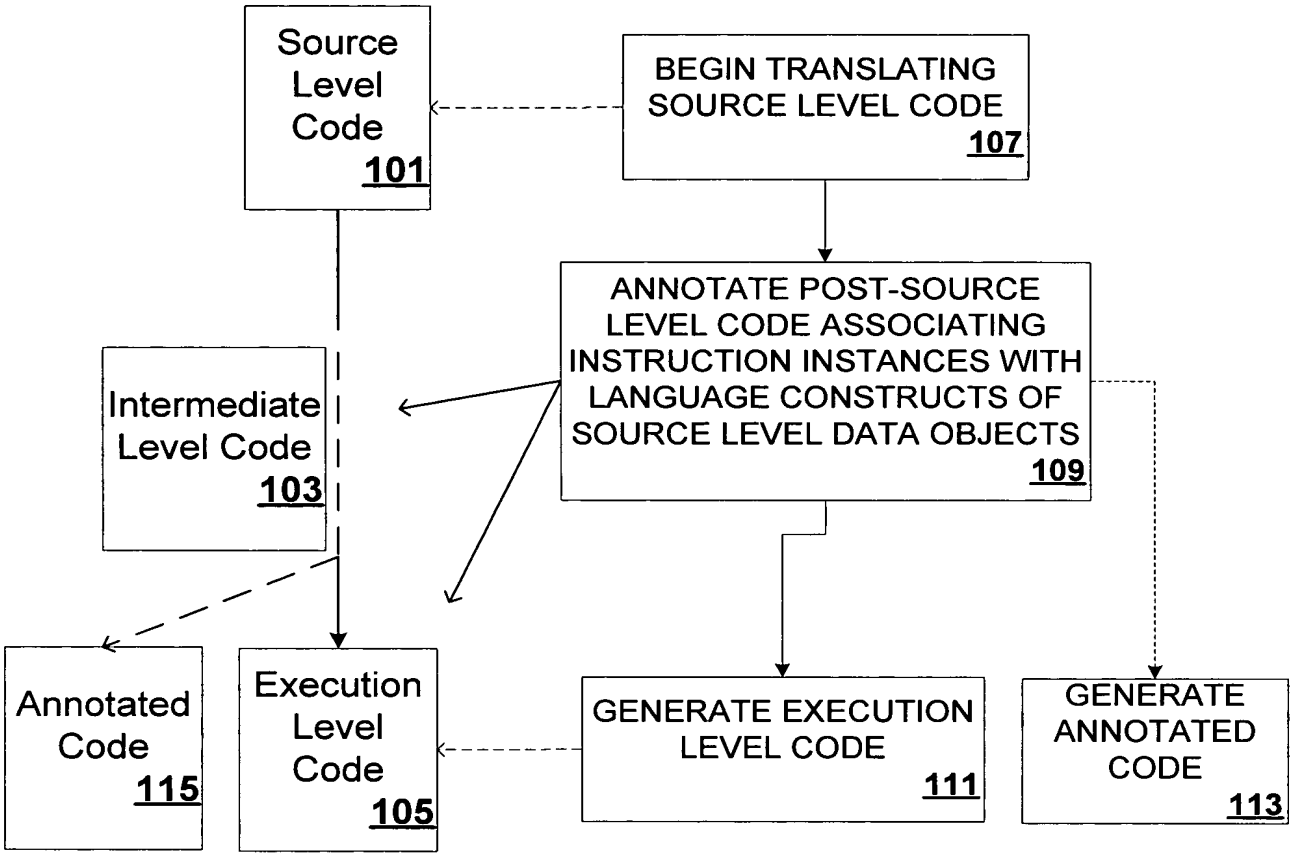
Source Level Code 101
BEGIN TRANSLATING SOURCE LEVEL CODE 107
ANNOTATE POST-SOURCE LEVEL CODE ASSOCIATING INSTRUCTION INSTANCES WITH LANGUAGE CONSTRUCTS OF SOURCE LEVEL DATA OBJECTS 109
Intermediate Level Code 103
Annotated Code 115
Execution Level Code 105
GENERATE EXECUTION LEVEL CODE 111
GENERATE ANNOTATED CODE 113

FIG. 1

ANNOTATED CODE
209

PROGRAM COUNTER : INSTRUCTION : CONSTRUCT INDEX **201**
0X0024 : LDA [R3] R5 : 0 **203**
. . .
0X0040 : LDU [R4 + 5] R8 : 2 **205**
. . .

FIG. 2A

LANGUAGE CONSTRUCT INDEX TABLE
231

INDEX	LANGUAGE CONSTRUCT	ADDRESS
0	STRUCT TREE	0X02000000
1	INT TREE.LEAFS	0X02000020
2	STRUCT TREE.NODE	0X02000100
...		

FIG. 2B

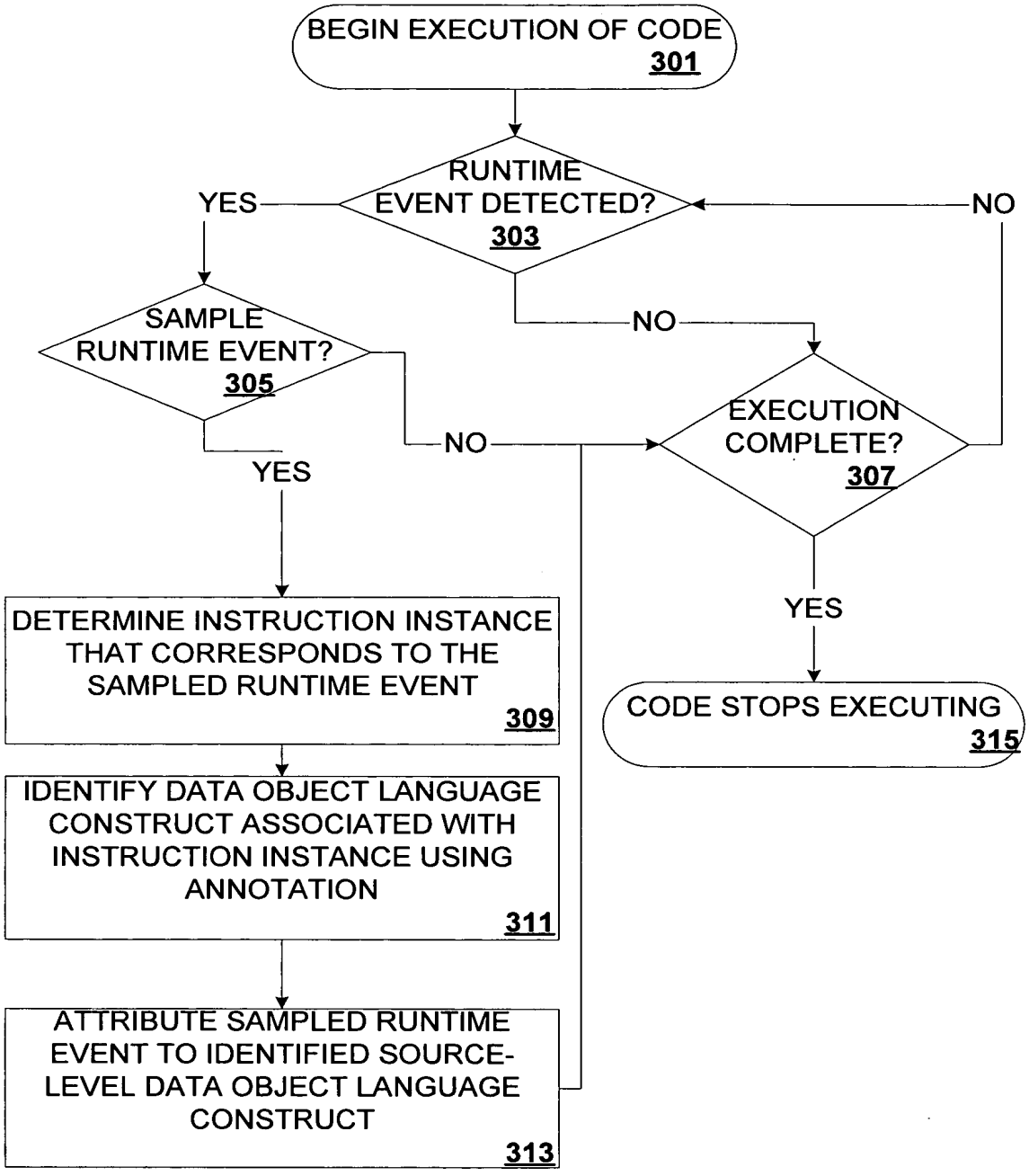
BEGIN EXECUTION OF CODE
301
RUNTIME EVENT DETECTED?
303
YES
NO
SAMPLE RUNTIME EVENT?
305
NO
YES
EXECUTION COMPLETE?
307
YES
NO
DETERMINE INSTRUCTION INSTANCE THAT CORRESPONDS TO THE SAMPLED RUNTIME EVENT
309
IDENTIFY DATA OBJECT LANGUAGE CONSTRUCT ASSOCIATED WITH INSTRUCTION INSTANCE USING ANNOTATION
311
ATTRIBUTE SAMPLED RUNTIME EVENT TO IDENTIFIED SOURCE-LEVEL DATA OBJECT LANGUAGE CONSTRUCT
313
CODE STOPS EXECUTING
315

FIG. 3

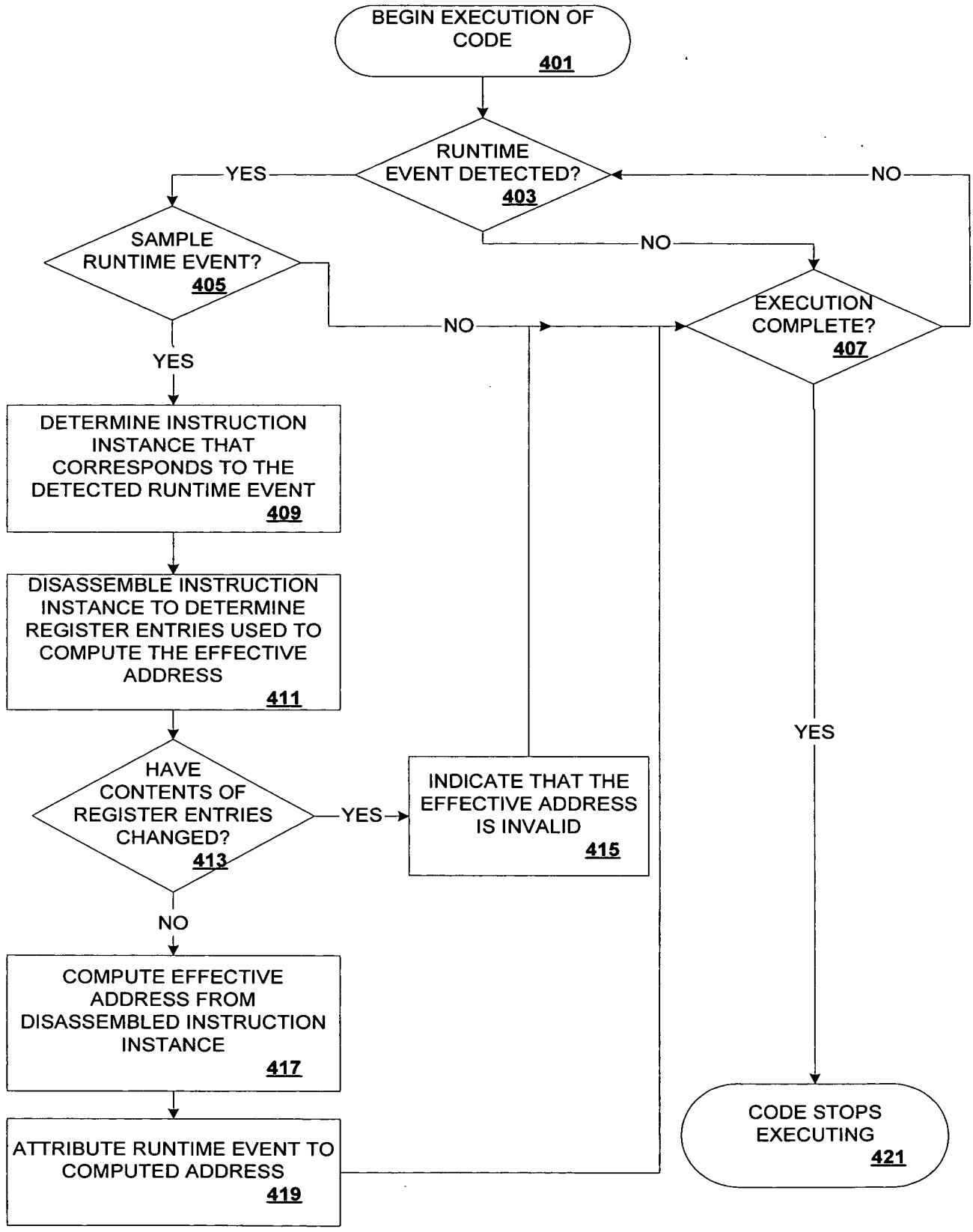
BEGIN EXECUTION OF CODE
401
RUNTIME EVENT DETECTED?
403
YES
NO
SAMPLE RUNTIME EVENT?
405
NO
EXECUTION COMPLETE?
407
YES
NO
YES
DETERMINE INSTRUCTION INSTANCE THAT CORRESPONDS TO THE DETECTED RUNTIME EVENT
409
DISASSEMBLE INSTRUCTION INSTANCE TO DETERMINE REGISTER ENTRIES USED TO COMPUTE THE EFFECTIVE ADDRESS
411
HAVE CONTENTS OF REGISTER ENTRIES CHANGED?
413
YES
INDICATE THAT THE EFFECTIVE ADDRESS IS INVALID
415
NO
COMPUTE EFFECTIVE ADDRESS FROM DISASSEMBLED INSTRUCTION INSTANCE
417
ATTRIBUTE RUNTIME EVENT TO COMPUTED ADDRESS
419
CODE STOPS EXECUTING
421

FIG. 4

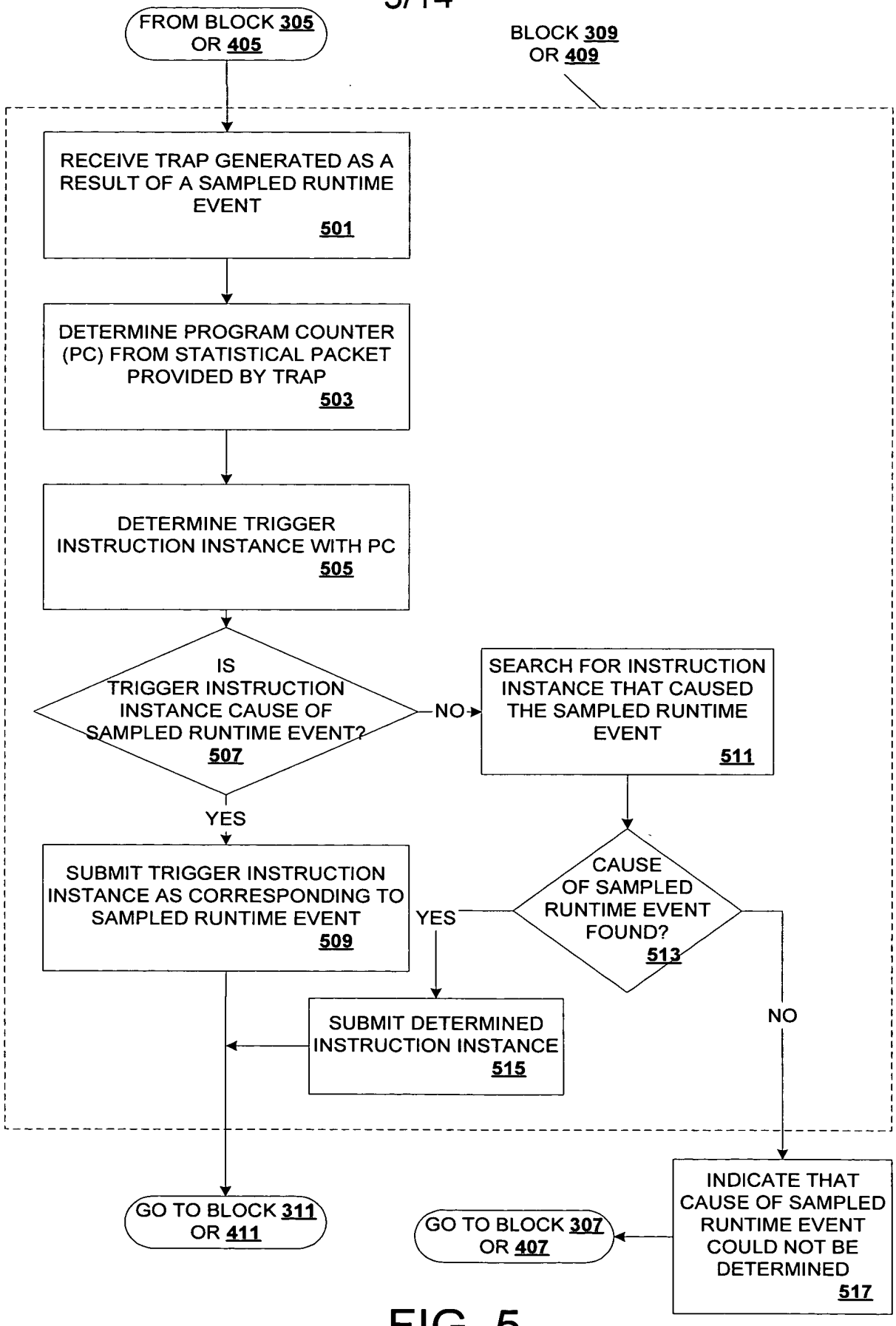
FROM BLOCK 305 OR 405
BLOCK 309 OR 409
RECEIVE TRAP GENERATED AS A RESULT OF A SAMPLED RUNTIME EVENT 501
DETERMINE PROGRAM COUNTER (PC) FROM STATISTICAL PACKET PROVIDED BY TRAP 503
DETERMINE TRIGGER INSTRUCTION INSTANCE WITH PC 505
IS TRIGGER INSTRUCTION INSTANCE CAUSE OF SAMPLED RUNTIME EVENT? 507
NO
SEARCH FOR INSTRUCTION INSTANCE THAT CAUSED THE SAMPLED RUNTIME EVENT 511
YES
SUBMIT TRIGGER INSTRUCTION INSTANCE AS CORRESPONDING TO SAMPLED RUNTIME EVENT 509
CAUSE OF SAMPLED RUNTIME EVENT FOUND? 513
YES
NO
SUBMIT DETERMINED INSTRUCTION INSTANCE 515
GO TO BLOCK 311 OR 411
GO TO BLOCK 307 OR 407
INDICATE THAT CAUSE OF SAMPLED RUNTIME EVENT COULD NOT BE DETERMINED 517

FIG. 5

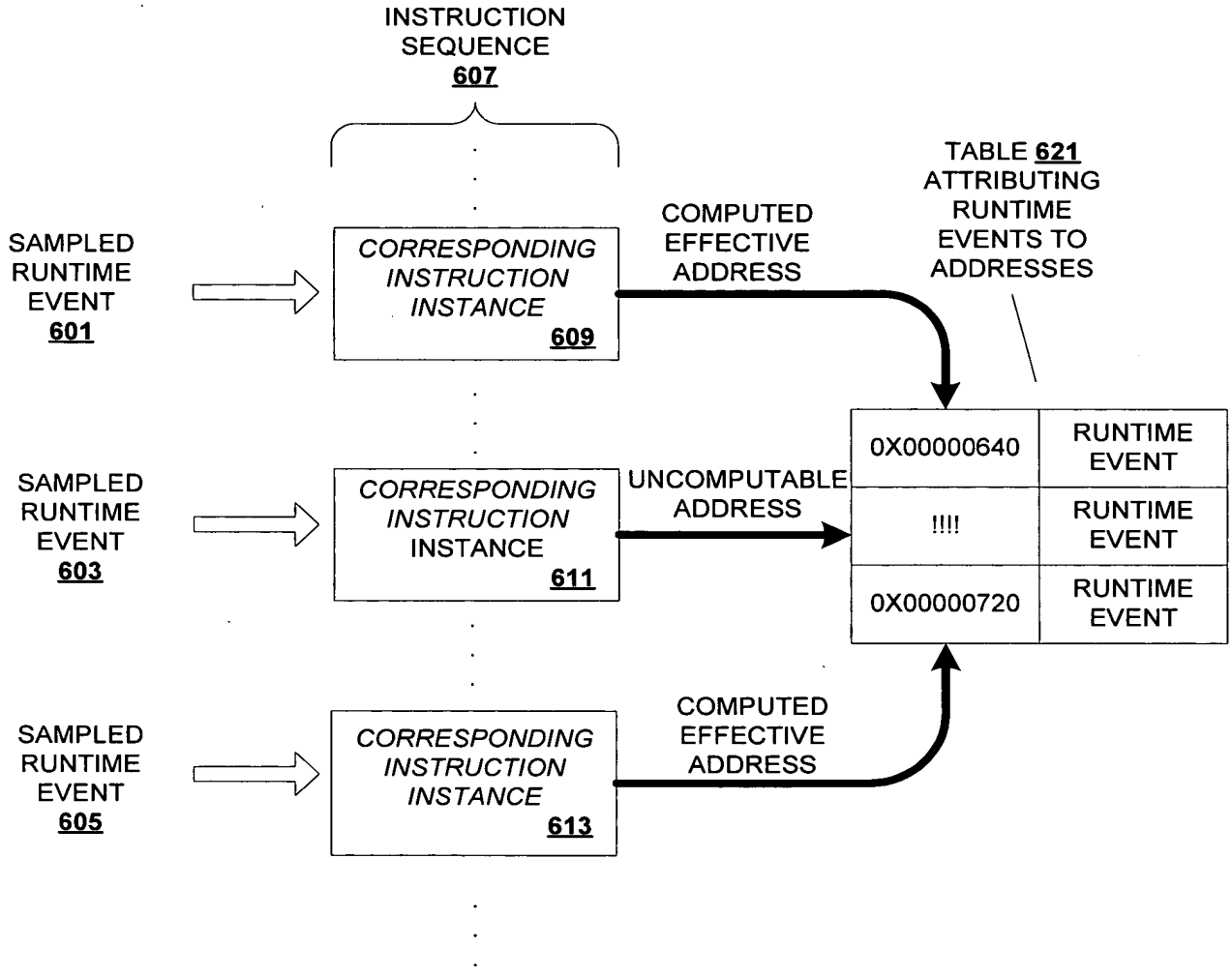
INSTRUCTION SEQUENCE 607
TABLE 621 ATTRIBUTING RUNTIME EVENTS TO ADDRESSES
SAMPLED RUNTIME EVENT 601
CORRESPONDING INSTRUCTION INSTANCE 609
COMPUTED EFFECTIVE ADDRESS
SAMPLED RUNTIME EVENT 603
CORRESPONDING INSTRUCTION INSTANCE 611
UNCOMPUTABLE ADDRESS
SAMPLED RUNTIME EVENT 605
CORRESPONDING INSTRUCTION INSTANCE 613
COMPUTED EFFECTIVE ADDRESS
0X00000640
RUNTIME EVENT
!!!!
RUNTIME EVENT
0X00000720
RUNTIME EVENT

FIG. 6

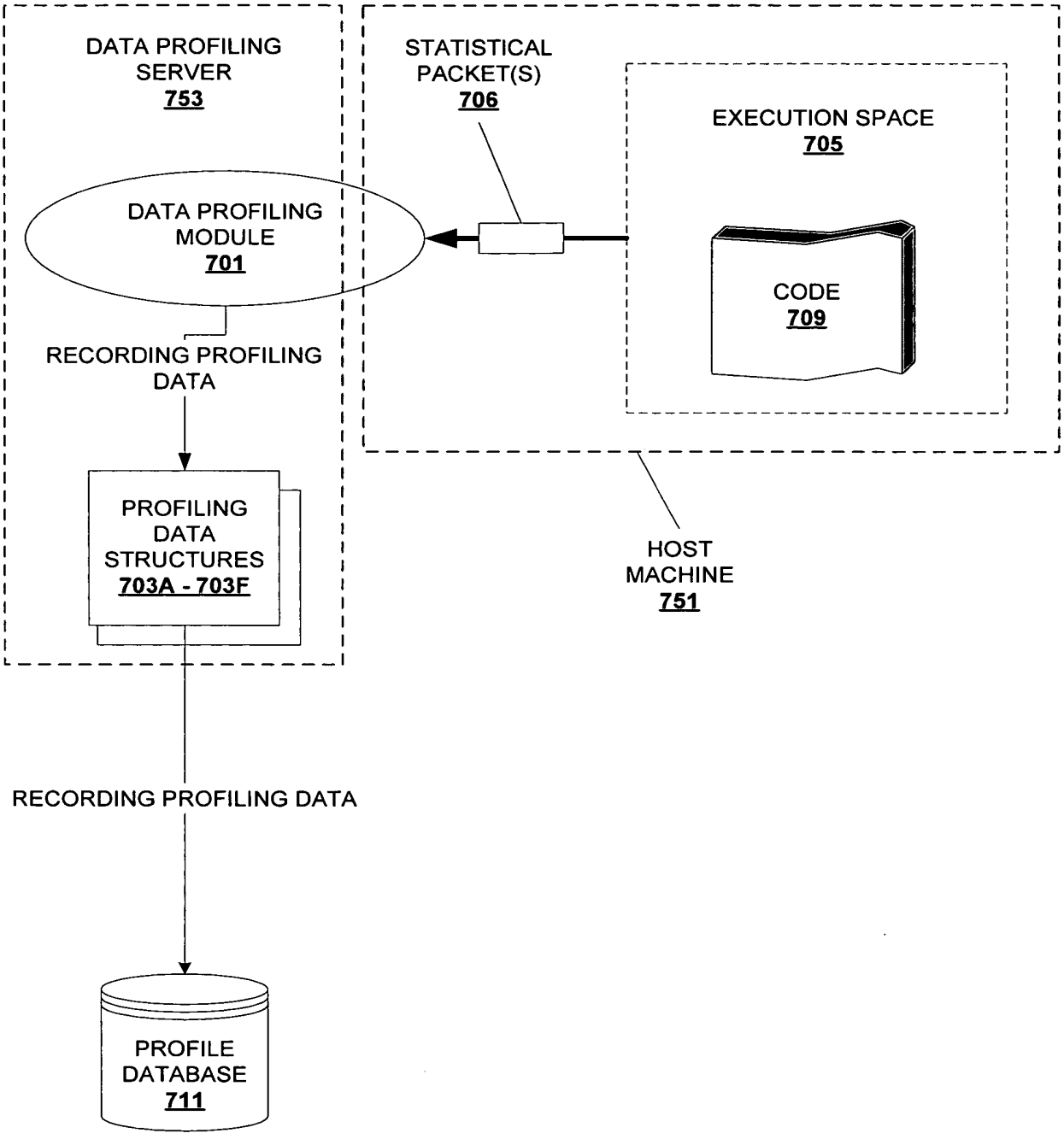
DATA PROFILING SERVER
753
STATISTICAL PACKET(S)
706
EXECUTION SPACE
705
DATA PROFILING MODULE
701
CODE
709
RECORDING PROFILING DATA
PROFILING DATA STRUCTURES
703A - 703F
HOST MACHINE
751
RECORDING PROFILING DATA
PROFILE DATABASE
711

FIG. 7

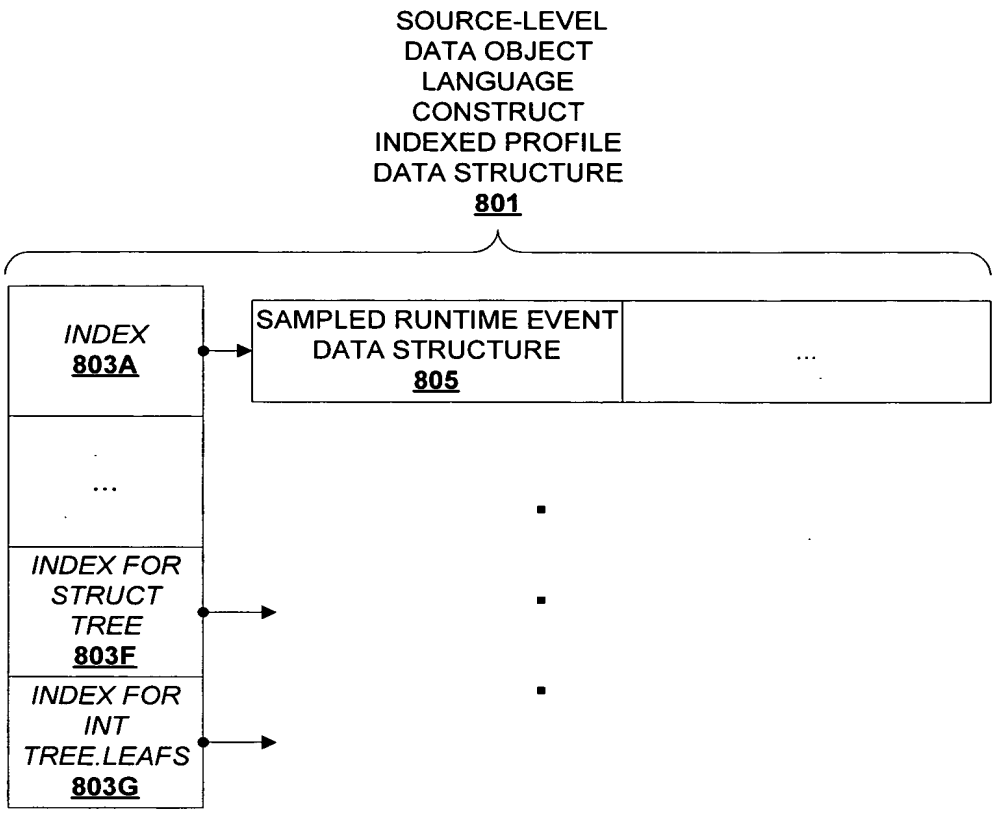
SOURCE-LEVEL
DATA OBJECT
LANGUAGE
CONSTRUCT
INDEXED PROFILE
DATA STRUCTURE
801
INDEX
803A
SAMPLED RUNTIME EVENT
DATA STRUCTURE
805
...
...
INDEX FOR
STRUCT
TREE
803F
INDEX FOR
INT
TREE.LEAFS
803G

FIG. 8A

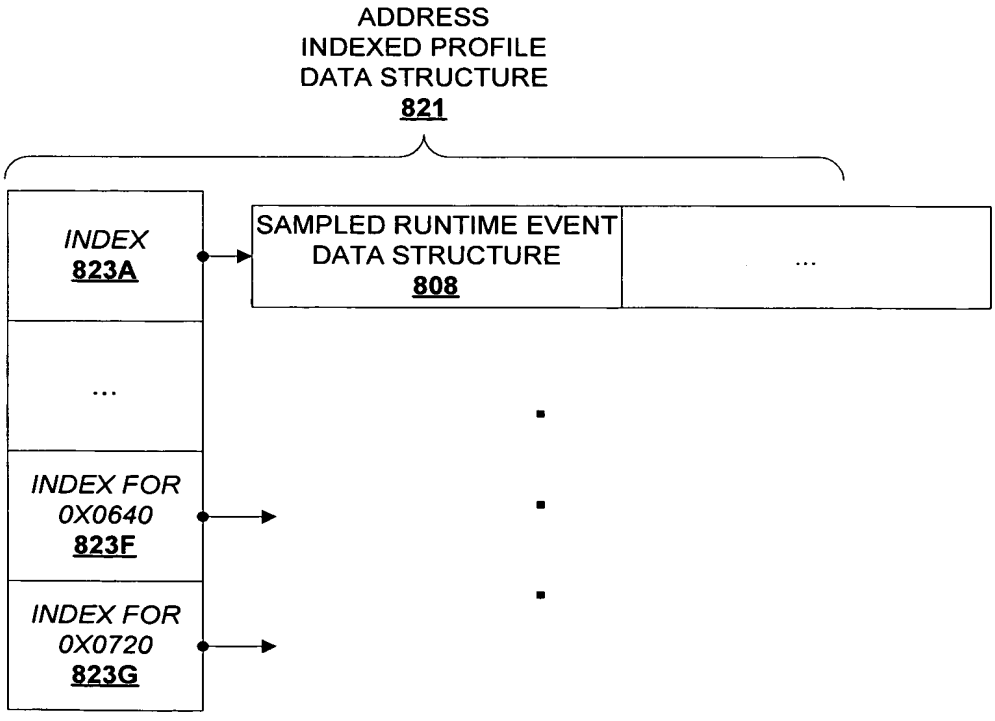
ADDRESS
INDEXED PROFILE
DATA STRUCTURE
821
INDEX
823A
SAMPLED RUNTIME EVENT
DATA STRUCTURE
808
...
...
INDEX FOR
0X0640
823F
INDEX FOR
0X0720
823G

FIG. 8B

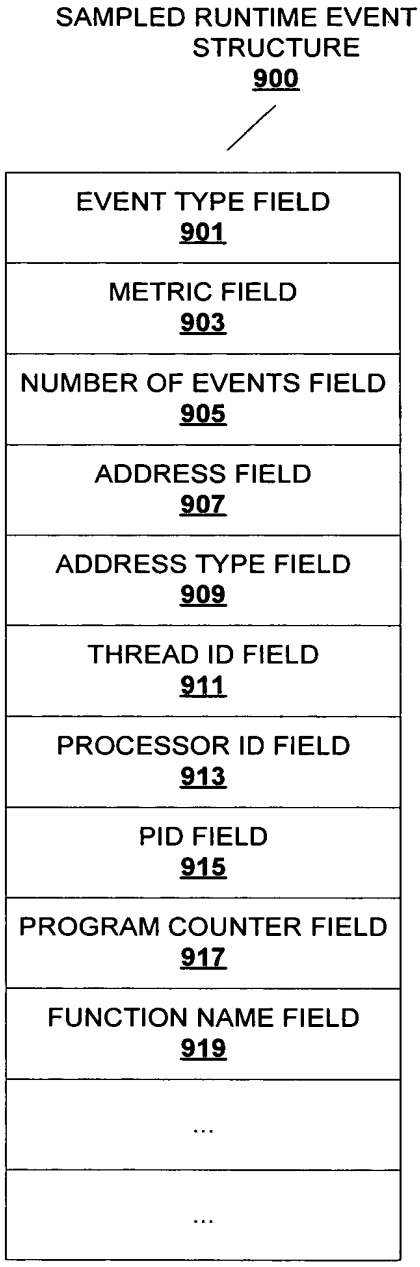
SAMPLED RUNTIME EVENT DATA STRUCTURE
900
EVENT TYPE FIELD
901
METRIC FIELD
903
NUMBER OF EVENTS FIELD
905
ADDRESS FIELD
907
ADDRESS TYPE FIELD
909
THREAD ID FIELD
911
PROCESSOR ID FIELD
913
PID FIELD
915
PROGRAM COUNTER FIELD
917
FUNCTION NAME FIELD
919
...
...

FIG. 9

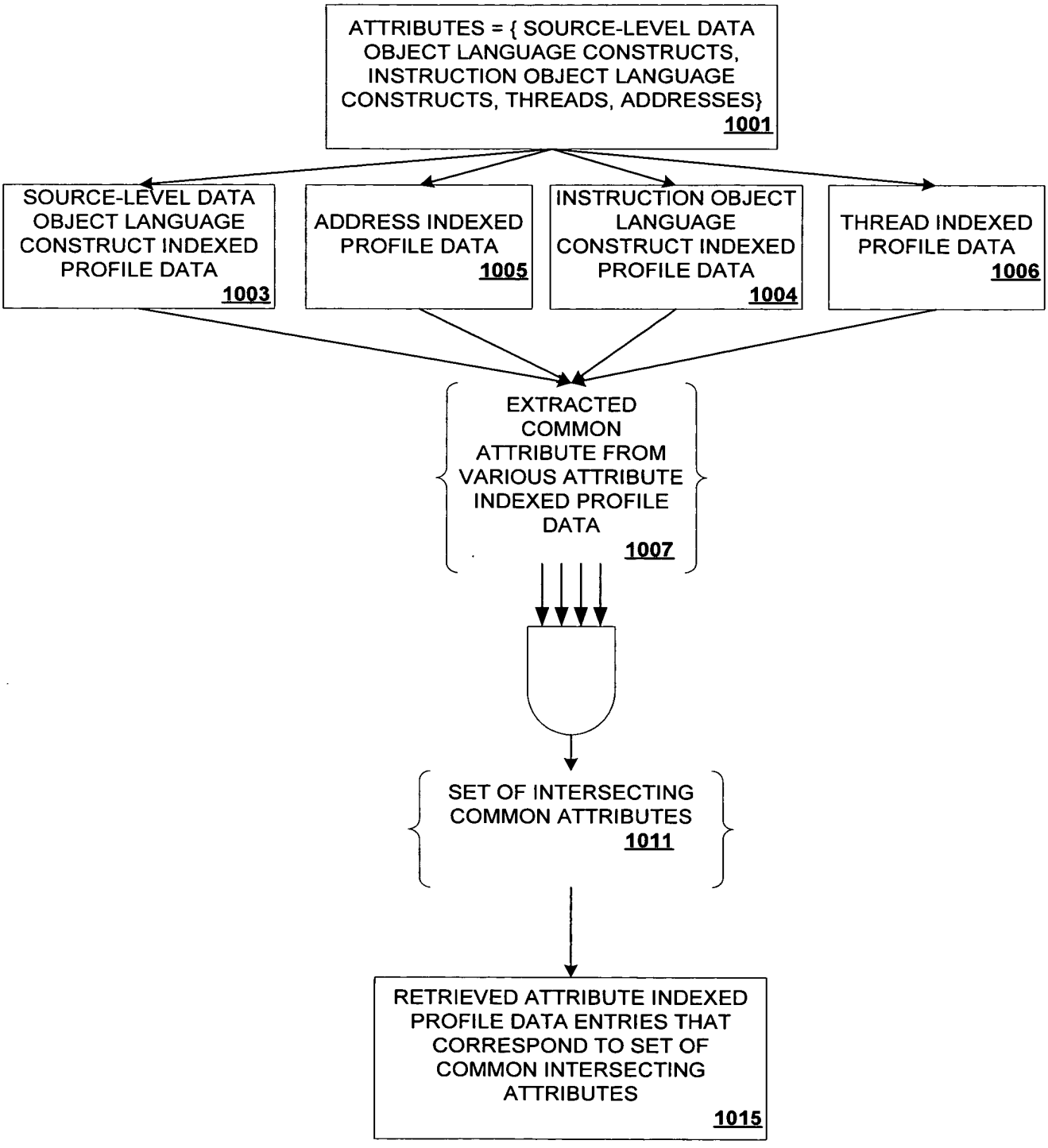
ATTRIBUTES = { SOURCE-LEVEL DATA OBJECT LANGUAGE CONSTRUCTS, INSTRUCTION OBJECT LANGUAGE CONSTRUCTS, THREADS, ADDRESSES}
1001
SOURCE-LEVEL DATA OBJECT LANGUAGE CONSTRUCT INDEXED PROFILE DATA
1003
ADDRESS INDEXED PROFILE DATA
1005
INSTRUCTION OBJECT LANGUAGE CONSTRUCT INDEXED PROFILE DATA
1004
THREAD INDEXED PROFILE DATA
1006
EXTRACTED COMMON ATTRIBUTE FROM VARIOUS ATTRIBUTE INDEXED PROFILE DATA
1007
SET OF INTERSECTING COMMON ATTRIBUTES
1011
RETRIEVED ATTRIBUTE INDEXED PROFILE DATA ENTRIES THAT CORRESPOND TO SET OF COMMON INTERSECTING ATTRIBUTES
1015

FIG. 10

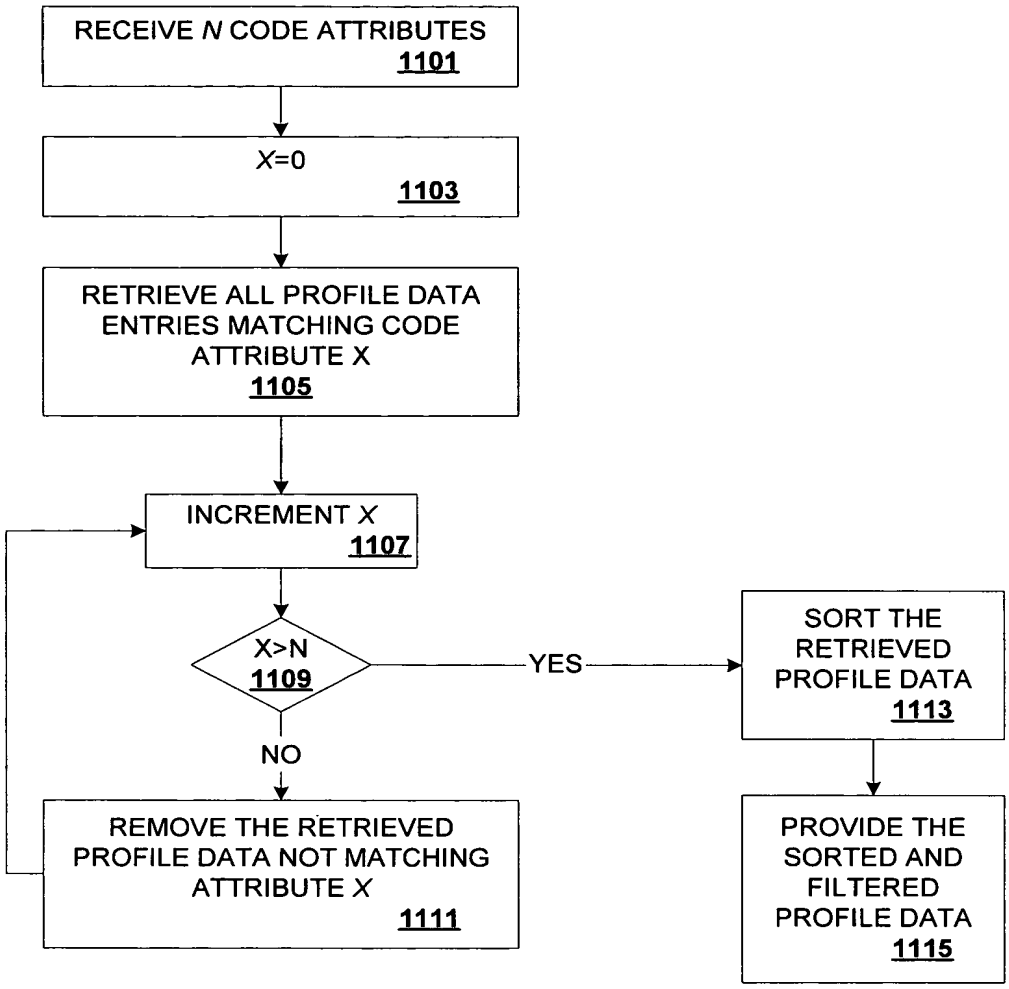

FIG. 11

DATA STALL SECONDS	ADDRESS	ADDRESS TYPE
549.909	<TOTAL>	
75.303	0X02000640	PHYSICAL
14.270	0X00000720	PHYSICAL
...	...	
...	...	VIRTUAL

FIG. 12

E$ STALL SECONDS	DATA E$ READ MISSES %	DATA E$ REFERENCES %	DATA DTLB MISSES %	SOURCE-LEVEL DATA OBJECT LANGUAGE CONSTRUCT
297.569	100.00	100.00	100.00	<TOTAL>
166.402	59.4	37.3	70.0	TREE
124.601	39.5	41.4	29.7	TABLE
...	...	...	...	...
...	...	...	...	...

FIG. 13A

E$ STALL SECONDS	DATA E$ READ MISSES%	DATA E$ REFERENCES %	DATA DTLB MISSES %	SOURCE- LEVEL DATA OBJECT LANGUAGE CONSTRUCT
166.402	59.4	37.3	70.0	TREE
29.1	8.2	3.7	0.1	INT TREE.LEAFS
...	...	...	...	...
...	...	...	...	...

FIG. 13B

PROFILE DATA FOR FUNCTIONS

E$ STALL SECONDS	E$ CYCLES %	FUNCTIONS
785.235	100.00	<TOTAL>
39.262	5.00	STACK_CONTROL
38.477	4.9	GARBAGE_COLLECT
...	...	...
...	...	...

FIG. 14A

PROFILE DATA FOR SOURCE- LEVEL DATA OBJECT LANGUAGE CONSTRUCTS

E$ STALL SECONDS	E$ CYCLES %	SOURCE- LEVEL DATA OBJECT LANGUAGE CONSTRUCTS
785.235	100.00	<TOTAL>
117.785	15.00	TOS
94.239	12.00	NUM_ENTRIES
...	...	...
...	...	...

FIG. 14B

PROFILE DATA FOR FUNCTIONS FILTERED BY TIME

E$ STALL SECONDS	E$ CYCLES %	TIME IN SECONDS
785.235	100.00	<TOTAL>
15.704	2.00	0 - 10
23.557	3.00	10 - 20
196.309	25.00	20 - 30
	...	...

FIG. 14C

PROFILE DATA FILTERED BY TIME (20 - 30 SECONDS) AND FUNCTION

E$ STALL SECONDS	E$ CYCLES %	E$ CYCLES % FOR SELECTED PARAMETERS	FUNCTIONS
196.309	25.00	100.00	<TOTAL>
31.409	4.00	16.00	GARBAGE_COLLECT
5.889	0.75	3.00	STACK_CONTROL
...	...	...	...

FIG. 14D

PROFILE DATA FILTERED BY TIME (20 - 30 SECONDS)
FOR FUNCTION GARBAGE_COLLECT

E$ STALL SECONDS	E$ CYCLES %	E$ CYCLES % FOR SELECTED PARAMETERS	SOURCE-LEVELDATA OBJECTS
31.409	4.0	100.00	<TOTAL>
29.839	3.8	95.00	STRUCTURE H
...	...		...
...	...		...

FIG. 14E

PROFILE DATA FILTERED BY TIME (20 - 30 SECONDS) FOR
STRUCTURE H OF FUNCTION GARBAGE COLLECT

E$ STALL SECONDS	E$ CYCLES %	E$ CYCLES % FOR SELECTED PARAMETERS	H ELEMENTS [OFFSET]
29.839	3.8	100.00	<TOTAL>
14.9195	1.9	50.0	H.HEAD [0]
0.0	0.0	0.0	H.TAIL [4]
...	...	...	...
14.9195	1.9	50.0	H.VOLUME [158]

FIG. 14F